

AMD Opteron™ Processor: Enabling Embedded Designs

Agenda

- Why x86 and AMD64 Technology Embedded Designs?
- AMD Supports High-End Embedded Designs
- AMD64 Technology Solution Set – Mobile to Server
- A Rich Ecosystem
- AMD Opteron processor 100, 200 and 800 Series and sample designs
- AMD Defines Industry Leadership and Technology Innovation
- Backup

Why x86 for Embedded Designs?

- Cost-effective over custom, proprietary processor designs
- Provides an industry-standard architecture for both 32- and 64-bit computing
- Wide range of power and performance combinations readily available
- Designs built on x86 can immediately take advantage of the wealth of hardware and software options already available – *“the x86 ecosystem”*



<http://en.wikipedia.org/wiki/X86>

Why AMD64 Technology for Embedded Designs?

- Driven by customer request
- The AMD Opteron™ processor supports the unique needs of the high-end embedded market
 - Lowers overall system cost due to reduced design complexity
 - Occupies smaller board footprint
 - Drastically reduces latency
 - Increases bandwidth
 - Lowers overall power consumption and available in several power envelopes
- Supports The Needs of the Enterprise
 - Provides further data center platform unification
 - Enables storage and telecommunications markets

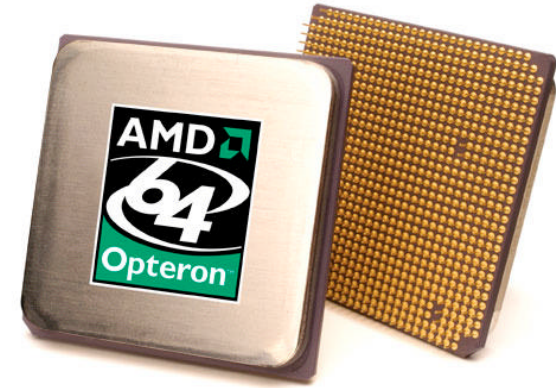
AMD Opteron™ Processor Architectural Advantages



- Integrated Memory Controller
 - Lowers latency to memory
 - Supports higher memory bandwidth
 - Reduces board space and simplifies design
- HyperTransport™ Technology-based architecture
 - Improves multi-processor scalability
 - Provides tremendous I/O capacity
 - Simplifies product design by reducing chip-count
 - Supports a wide range of processor product options using the same socket and chipset infrastructure
- AMD PowerNow!™ Reduces Power Consumption
 - Lowers Total Cost of Ownership with less power consumption and a reduced need for ambient cooling in the data center

AMD Supports High-end Embedded Designs

- High performance processors with superior architecture
 - Integrated memory controller
 - HyperTransport™ Technology
 - 32- and 64-bit capability
 - x86 instruction set
- Longevity of supply to support embedded designs
- Choice of chipsets to satisfy system configuration requirements
- Available Professional Design Support Services can speed time to market



Embedded Opportunities Expand Your Market Reach

AMD64 Longevity Program Details

- **Roadmap:** Embedded AMD Opteron processors are derived from a subset of the existing AMD Opteron server/workstation processor roadmap
 - Parts are identical to server/workstation parts and are generally launched within 60 days of s/ws availability
 - Product longevity is defined by Ordering Part Number (OPN) rather than model number
 - OPN will remain consistent throughout the longevity period (5 years + 2 years possible EOL contract)
- **Processor Change Management:** AMD Manufacturing will maintain customer system image stability during the longevity period – no changes to form, fit, function or foundry process
 - One image over the life of the OPN
 - Process changes will not affect end system operation (i.e. electrical specifications)
- **Pricing Strategy:**
 - Identical pricing as s/ws parts during standard product life cycle
 - Market-driven price after s/ws EOL
 - Last price bin +/- 10% per year

High-end Embedded Markets for AMD Opteron™ Processors

Storage

Applications

- Network Attached Storage (NAS)
- System Area Networks (SAN)
- Video on Demand
- Storage Appliances

AMD64 Technology Advantage

- Memory system performance
- I/O performance
- I/O capacity
- Multi-processor scalability



Digital Imaging/Media

Applications

- Medical Imaging
- Security Scanning devices
- Audio mixing stations
- Non Linear Video Editing
- HDTV encoders

AMD64 Technology Advantage

- Memory system performance
- I/O Performance
- Multi-Processor scalability
- Flexible HyperTransport™ technology-based system architecture



High-end Embedded Markets for AMD Opteron™ Processors

Communications

Applications

- Switches/Routers/VoIP PBXs
- SS7 server
- Network Attached Computing
- AdvancedTCA and Compact PCI
- Speech recognition and processing

AMD64 Technology Advantage

- Memory performance
- I/O performance
- HyperTransport™ technology interface for custom accelerators



AdvancedTCA®

Other Embedded Markets

Applications

- Military Systems
- Industrial automation

AMD64 Technology Advantage

- Scalability
- Integrated memory controller
- Board-level debug



AMD64 Technology Solution Set



Customer-Centric Innovation



Your Link To The Future Of Computing



***Leading 32-bit
Value and
Performance***



***Leading Reduced
Power 32- and 64-bit
Performance***



***Leading Mainstream
Consumer and
Commercial
Performance***



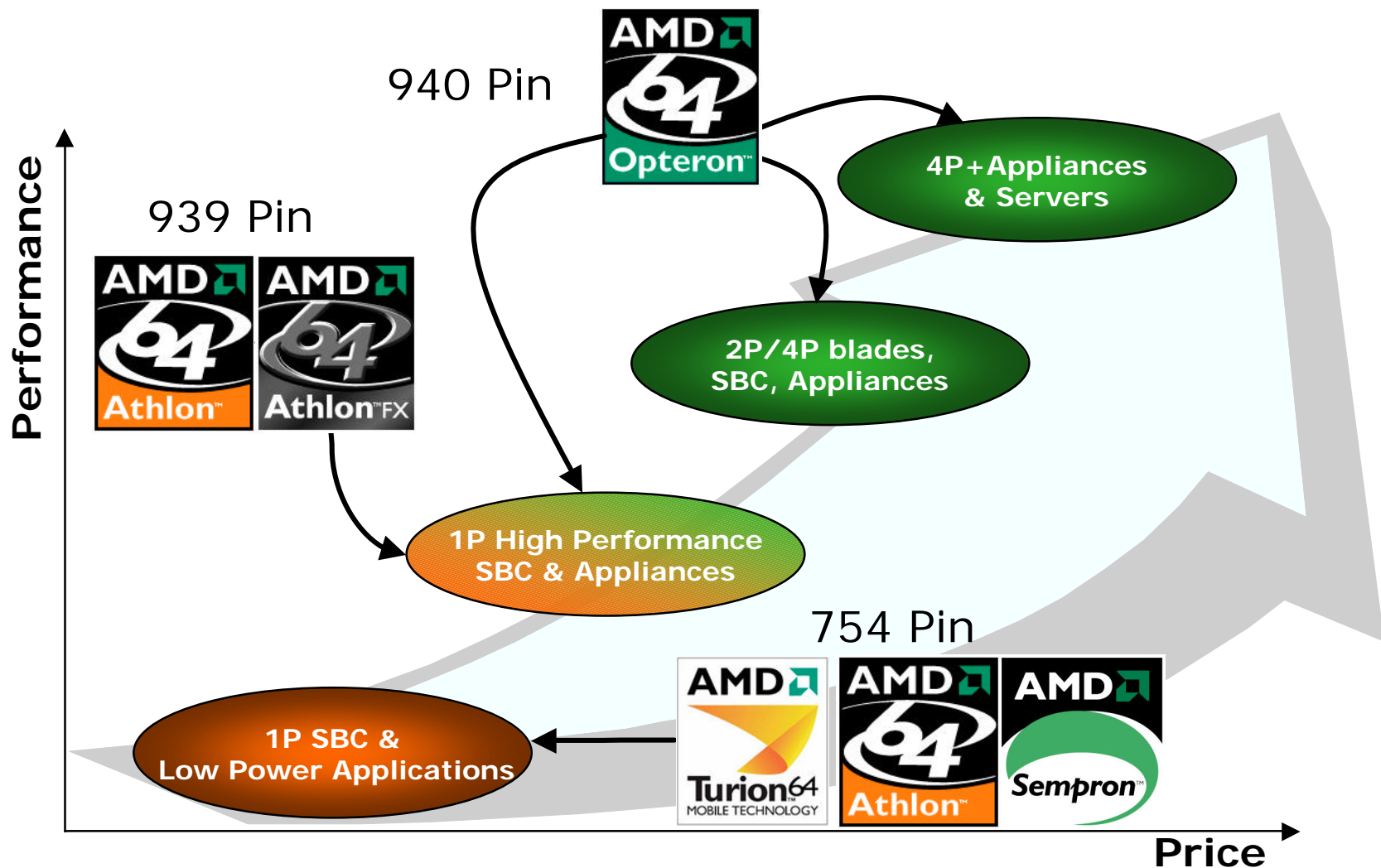
***Extreme Gaming
and Enthusiast
Computing,
Ultimate 3-D
capability***















***Reliable, Stable and
Scalable Enterprise
Class 32- and 64-bit
multiprocessing***



AMD64 Technology: Mobile to Server

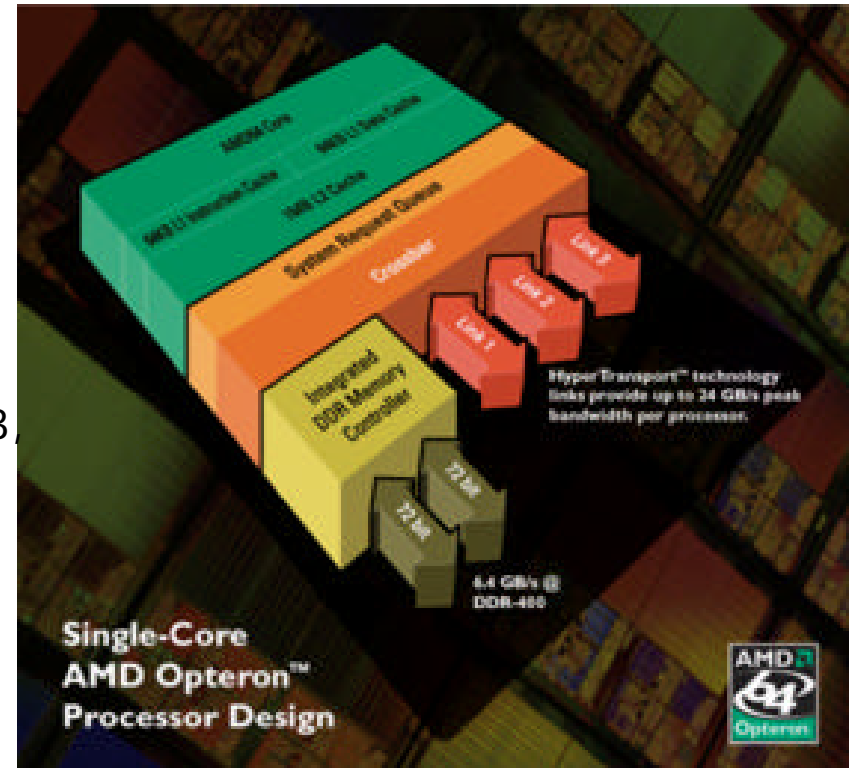


A Rich Ecosystem

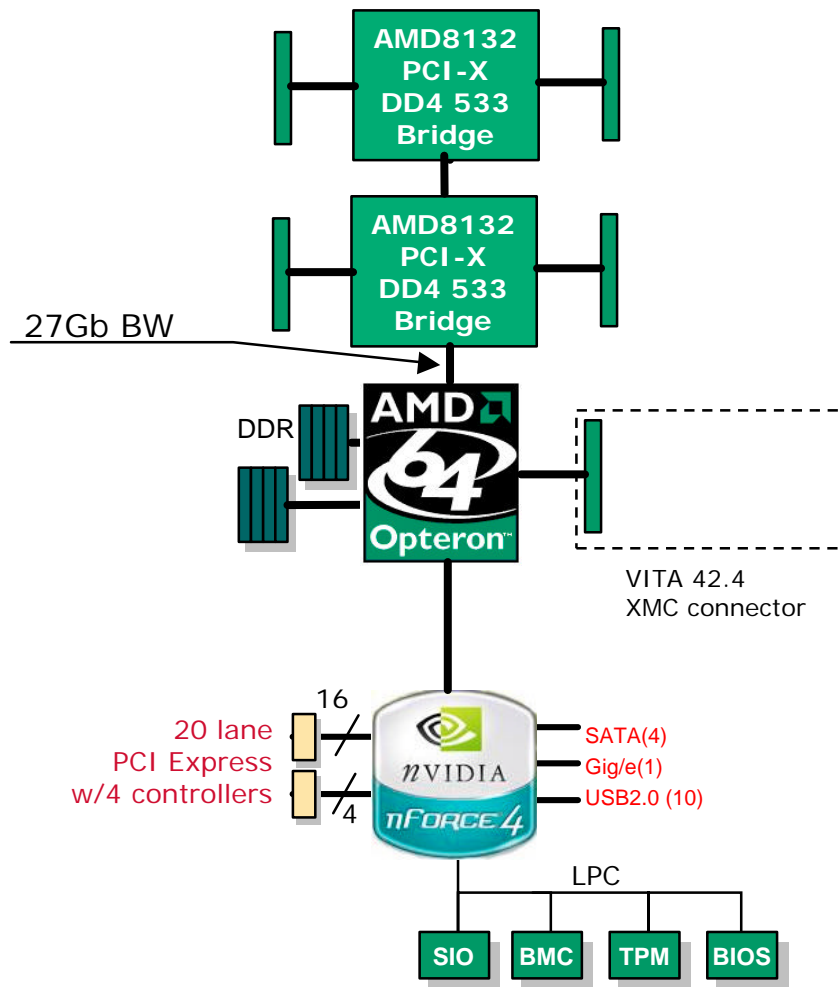
	AMD8132 PCI-X Bridge		RS480 - SVGA Bridge SB400 - South Bridge
	AS90L10208 PCI-X Bridge		HT1000 - South Bridge HT2000 - PCIe Bridge
	Nitrox SSL/IP Sec Bridge		CK8-04 - South Bridge IO-04 I/O - PCIe Bridge
	InfiniPath InfiniBand Bridge		K8T935 - South Bridge
	Stratix GX FPGA		RapidChip Mask programmable ASIC
	VirTexIV FPGA		HyperTransport™ technology IP

AMD Opteron™ Processor 100 Series

- **High-performance 32- and 64-bit** workstation, server, storage, & network platform
- **Single or Dual-core** 940-pin μ PGA package with identical socket, electrical, thermal properties
- **Power envelopes of 30, 55 and 95 watts**
- **16-byte ECC integrated memory controller** supporting DDR200, 266, 333, & 400
 - CHIPKILL ECC with x4 DRAMs
 - Drive up to 8 registered DIMMs
 - Can address up to 32GB of memory
- **Three 16-bit non-coherent HyperTransport™ technology links**
- **On-chip L1 & L2 cache**
 - 64KB L1 Icache and Dcache
 - 1MB ECC protected L2 cache



Sample Design: Single Board Computer



System Strengths:

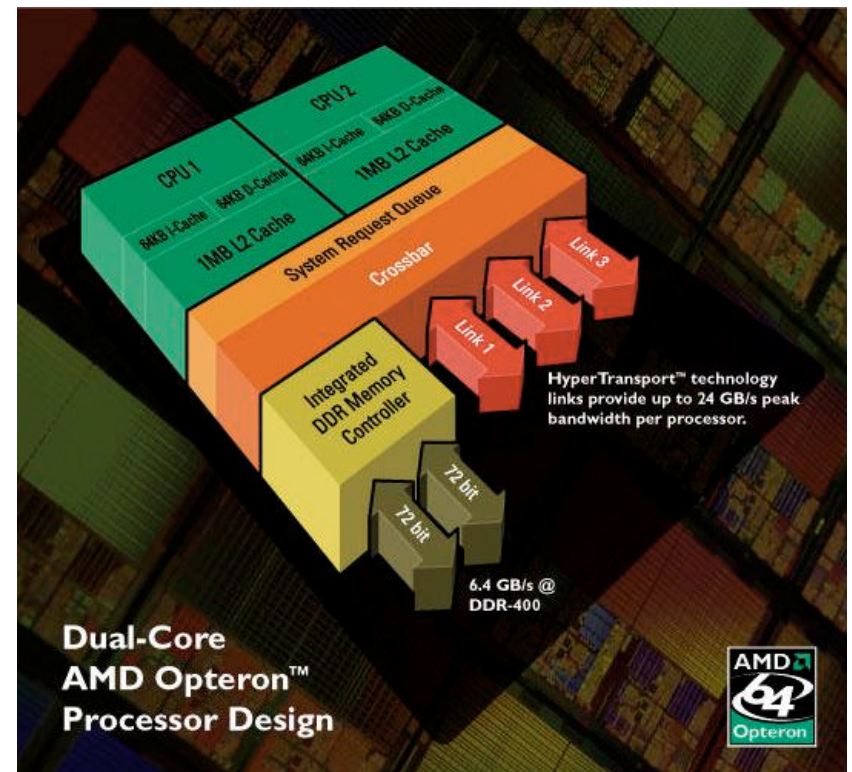
- High-performance
- Scale-out capability for systems where node and overall system scalability are key

Ideal for:

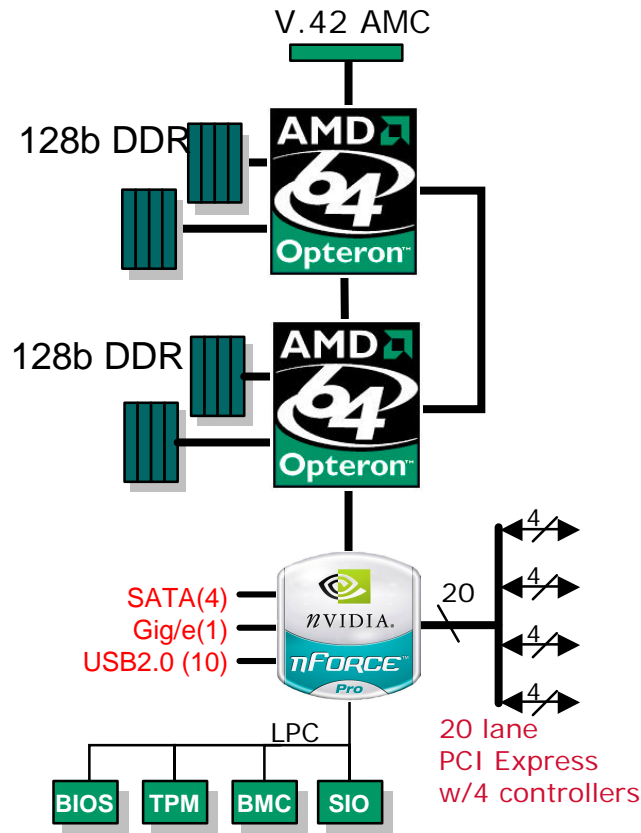
- Dense, 1U rack mount servers
- DCC Workstations
- Mid- to high-end network and storage appliances
- SBCs

AMD Opteron™ Processor 200 Series

- **2-way high-performance 32- and 64-bit** workstation, server, storage, & network platform
- **Single or Dual-core** 940-pin μ PGA package with identical socket, electrical, thermal properties
- **Power envelopes of 30, 55 and 95 watts**
- **16-byte ECC integrated memory controller** supporting DDR200, 266, 333, & 400
 - CHIPKILL ECC with x4 DRAMs
 - Drive up to 8 registered DIMMs
 - Can address up to 32GB of memory
- **One coherent and two 16-bit non-coherent HyperTransport™ technology links**
- **On-chip L1 & L2 cache**
 - 64KB L1 Icache and Dcache
 - 1MB ECC protected L2 cache



Sample Design: 2 Processor/4 Core ATCA Board

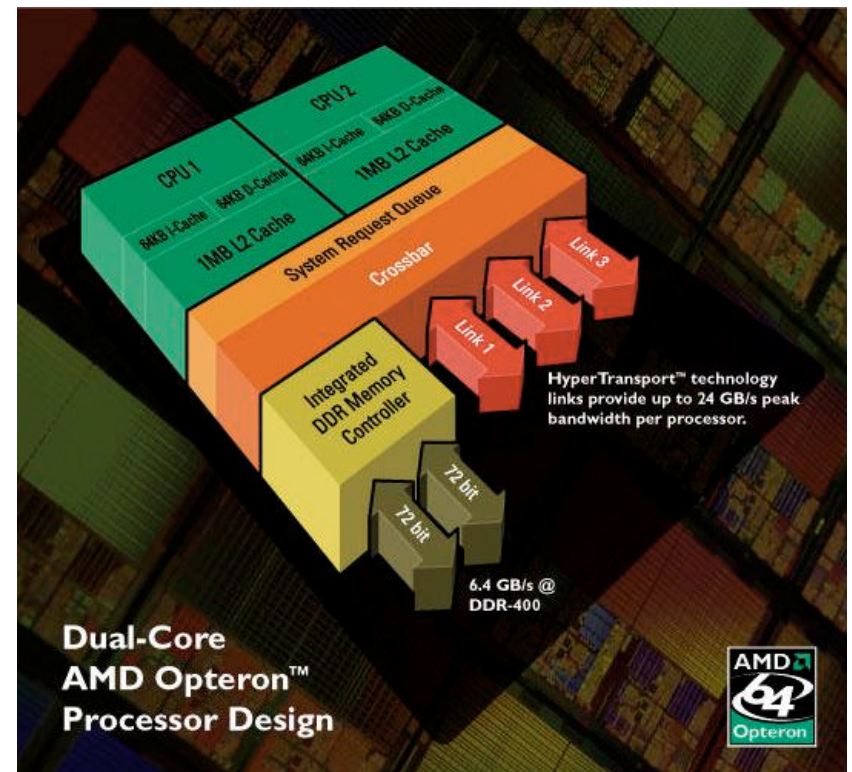


- The four PCI Express controllers on the NVIDIA CK8-04 can provide a 4-lane interface directly to the AdvancedTCA back plane
- Each four lane interface can connect to a PCI Express I/O card
- Each 4-lane PCI Express channel can provide up to 1GB of payload bandwidth
- The total card power scenario:
 - 2 processors @ 55 watts ea - 110W
 - 2 banks of DRAM – 20W
 - CK8-04 – 15W
 - Misc. – 10W
 - TOTAL ~155 Watts

AdvancedTCA®

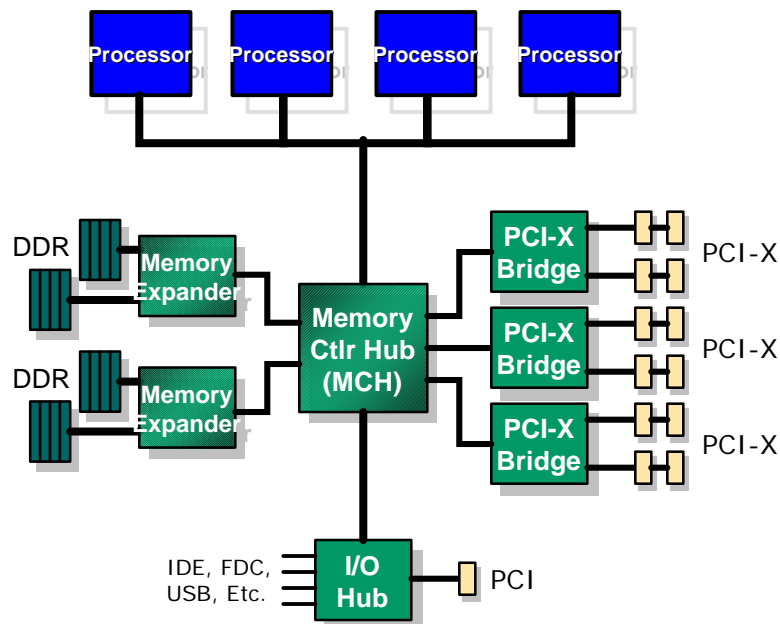
AMD Opteron™ Processor 800 Series

- **Up to 8P/16 core high-performance 32- and 64-bit server**
- **Single or Dual-core** 940-pin μ PGA package with identical socket, electrical, thermal properties
- **Power envelopes of 30, 55 and 95 watts**
- **16-byte ECC integrated memory controller** supporting DDR200, 266, 333, & 400
 - CHIPKILL ECC with x4 DRAMs
 - Drive up to 8 registered DIMMs
 - Can address up to 32GB of memory
- **Three 16-bit coherent HyperTransport™ technology links**
- **On-chip L1 & L2 cache**
 - 64KB L1 Icache and Dcache
 - 1MB ECC protected L2 cache



AMD Opteron™ Processor 800-Series 8P/16C System Architecture

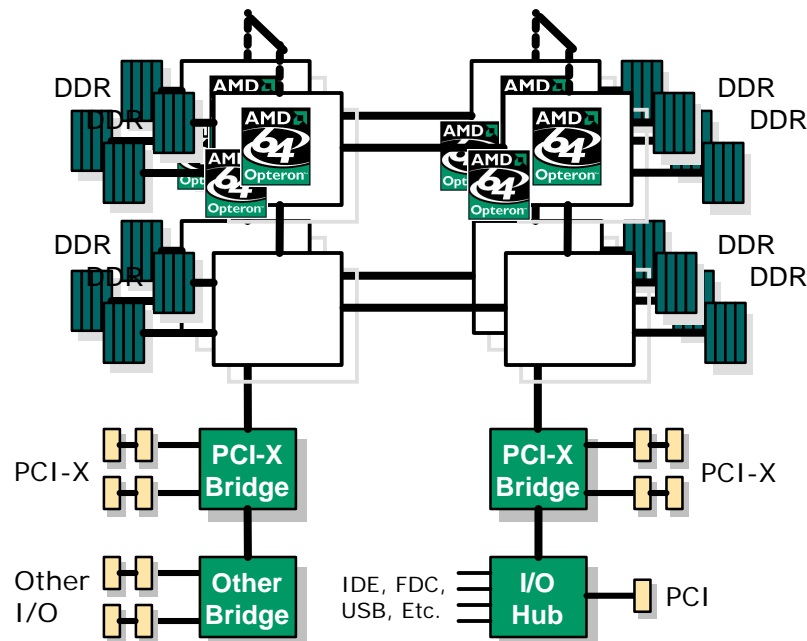
Typical MP System



Very limited system scalability with single MCH port to processors

- Maximum of 4 processors, *which must compete for FSB bandwidth*
- Memory size and bandwidth are constrained
- No more than 3 PCI-X bridges possible
- Many more chips and board real estate required

AMD Opteron System



Scalable memory and ample I/O bandwidth

- Up to 8 processors without glue logic
- Each processor adds 32GB of memory
- Fewer chips required

AMD Defines Industry Leadership and Technical Innovation

- **64-bit x86 CPUs:** AMD designed and was the first to ship 64-bit x86 processors
 - Integrated Memory Controller
 - 32- and 64-bit capable
 - Direct Connect Architecture reduces bottlenecks of legacy systems
 - Enables ease of migration for both hardware and software
- **HyperTransport™ technology:** AMD co-developed the industry's lowest latency, highest bandwidth interconnect
- **Dual- and Multi-core technology:** AMD defined and was the first to tape out and ship true dual-core x86 processors
- **Pacifica Virtualization technology:** AMD has followed server market trends in virtualization and adapted the processor to better utilize software-level technology advancements
- **AMD PowerNow!™ technology:** AMD has pioneered processor level power-management technology for all computing platforms, mobile to server
- **AMD64 Longevity Program and Professional Design Support Services:** AMD brings enterprise-class processors to embedded markets with full support for supply and design

Backup

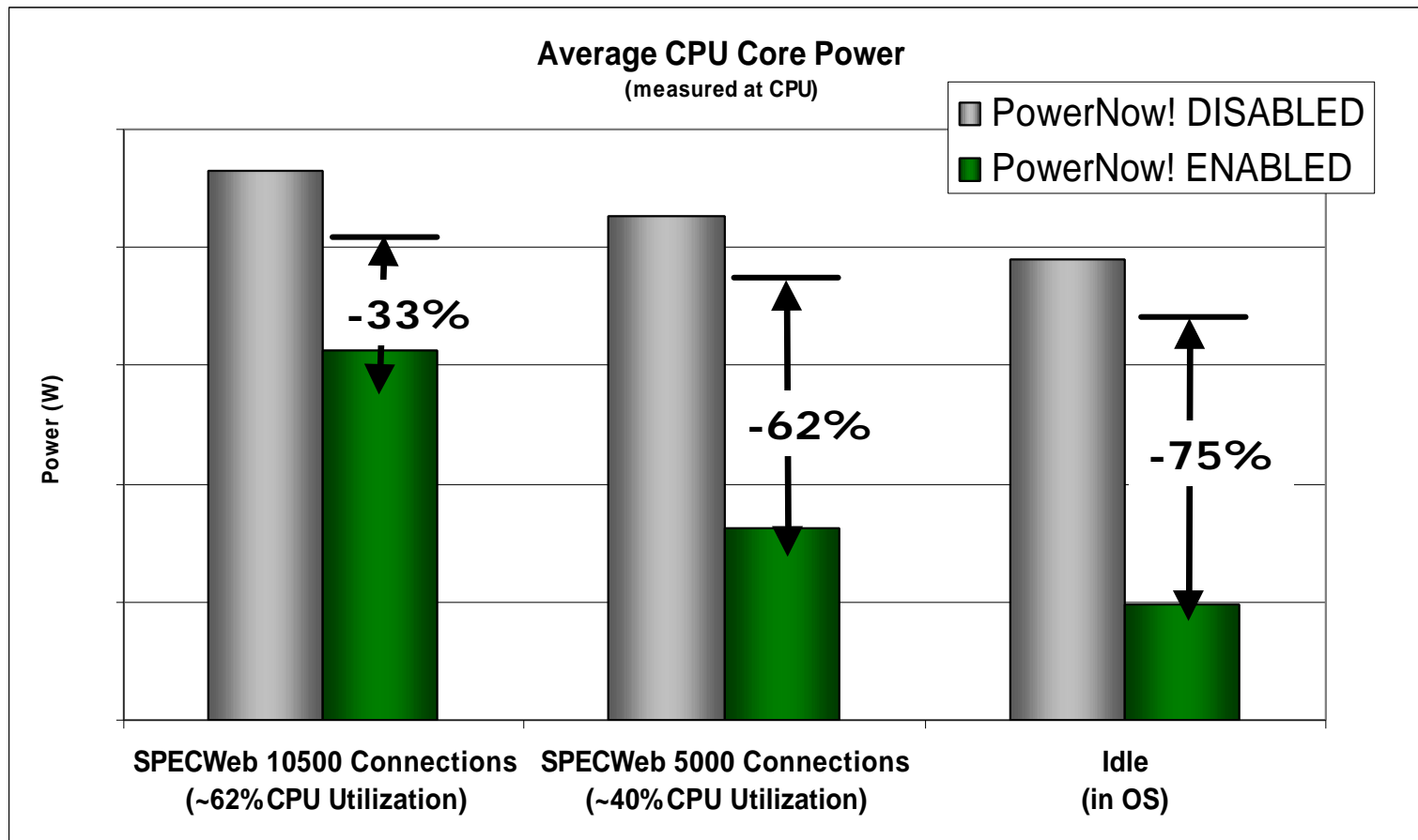
AMD PowerNow!™ Technology With Optimized Power Management

- AMD PowerNow! technology with Optimized Power Management is dynamic, power-on-demand technology that can help systems run at optimum performance and power levels, reducing electricity costs while maximizing IT budget dollars
- With a BIOS update from an OEM or system builder, AMD Opteron processors shipped after May 2004 can be enabled with AMD PowerNow! technology
- Benefits of AMD Opteron processors with AMD PowerNow! technology with Optimized Power Management:
 - Minimizes overall power consumption for enterprise IT and workstation customers by optimizing performance-on-demand
 - Strengthens the industry-leading performance-per-watt capabilities of the AMD Opteron processor
 - Decreases strain on datacenter cooling and ventilation systems



System Power Analysis

Benefits of AMD PowerNow!™ technology



AMD PowerNow!™ technology can provide up to 75% power savings!



Building the AMD64 Software Ecosystem

- Thousands of x86-based applications run today on AMD64 processors
- Over 300 ISVs and open source software organizations are actively promoting AMD64 compatibility
- AMD ecosystem efforts have focused on segment solution stacks
 - IT Infrastructure components
 - Server-Based Computing
 - Virtualization
 - Web and Application Servers
 - Vertical Applications
 - Scientific and Engineering
 - Business Processing

AMD64 Ecosystem Web Site April 2005 Statistics

Over 300 Development Organizations

Over 1,300 packages certified for AMD64
over 1,150 are shipping

120 operating system (versions)
Includes Linux, Solaris, UNIX, Windows
52 are 64-bit (32 shipping)

307 Development Tools (versions)
115 are 64-bit (87 shipping)

52 Database Engines (versions)
19 are 64-bit (13 shipping)

385 Infrastructure Applications
101 are 64-bit (76 shipping)

470 Vertical Applications
171 are 64-bit (114 shipping)

The AMD64 Software Ecosystem Continues to Grow!



Open Platform Management Architecture (OPMA) Specification

- OPMA defines a common hardware interface between the server platform and its management subsystem
- OPMA is the result of AMD's work with technology partners to develop an open and common interface between server management motherboards and management subsystem hardware
- Publishing this specification allows AMD's ISV and IHV partners to build OPMA-based products that offer end-users more accessible and affordable server management solutions
- The OPMA specification is open, like HyperTransport™ technology, meaning no vendor is excluded, there is no royalty for adoption, and a proper Adopter's Agreement has been put in place to ensure the specification remains open and accessible for all
- OPMA specification is located on www.amd.com

http://www.amd.com/us-en/Processors/ProductInformation/0,,30_118_8796_12498,00.html



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